

Aircraft Structural Analysis, Design Optimization, and Manufacturing Tool Integration, Phase I

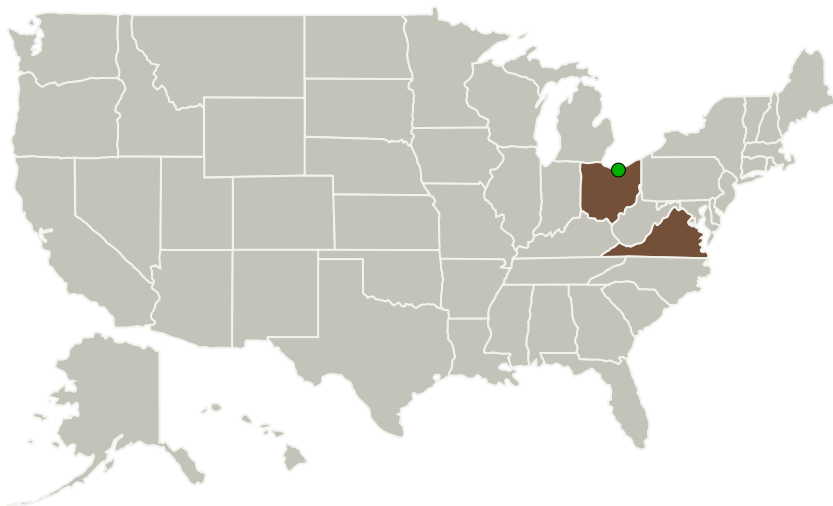
Completed Technology Project (2011 - 2011)



Project Introduction

Innovative research is proposed in integrating fundamental aircraft design processes with an emphasis on composite structures. Efficient, lightweight composite laminate structural design requires highly integrated structural analyses on the laminate and stiffened panel levels, while incorporating manufacturing processes and limitations. Laminate optimization is only one of the many design variables that need to be considered simultaneously in aircraft design. Yet true system level OML surface optimization is an extremely challenging problem that can only be made tractable by reducing the problem into three sequential gates: ply count compatibility, layup sequencing, and ply layout size and shape. The innovative approach proposed solves all three of these seemingly intractable gates and in so doing provides synergistic optimization of ply drops and adds and reduced manufacturing ply processing steps (drawing part numbers) along with laminate sizing to damage tolerance material allowables. To achieve the highest level of design fidelity requires iterative communication with the designer's CAD tool and ply zone mapping tools. Previous data exchange technology used by NASA to couple separate discipline design tools is the XML ASCII file format. Proposed is the evaluation and implementation of a binary format called 'HDF5'.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Collier Research & Development Corporation	Lead Organization	Industry	Hampton, Virginia
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Ohio	Virginia

Project Transitions

▶ **February 2011:** Project Start

✓ **September 2011:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/137986>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Collier Research & Development Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

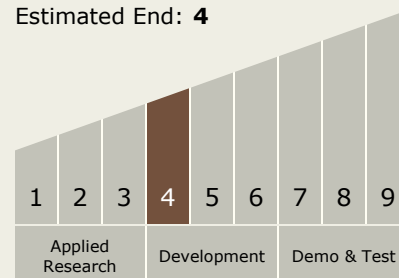
Carlos Torrez

Principal Investigator:

Craig S Collier

Technology Maturity (TRL)

Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.4 Manufacturing
 - └ TX12.4.1 Manufacturing Processes

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System